

What is claimed is:

1. In an implantable cardioverter/defibrillator of the type comprising a plurality of components including a relatively bulky high voltage battery, at least one high voltage capacitor, and circuitry powered by a low voltage power source for detecting a tachyarrhythmia, charging the high voltage capacitor, and discharging the high voltage capacitor to provide a cardioversion/defibrillation shock, the improvement comprising:

a first hermetically sealed housing supporting a first cardioversion/defibrillation electrode adapted to be implanted at a first subcutaneous implantation site about the patient's thorax directing the first cardioversion/defibrillation electrode toward the patient's heart;

a second hermetically sealed housing supporting a second cardioversion/defibrillation electrode adapted to be implanted at a second subcutaneous implantation site about the patient's thorax directing the second cardioversion/defibrillation electrode toward the patient's heart, whereby the heart is disposed substantially between the first and second cardioversion/defibrillation electrodes; and

an electrical cable having a plurality of conductors tethering the first and second hermetically sealed housings together,

wherein the components of the ICD are distributed between the first and second hermetically sealed housings, and conductors of the electrical cable interconnect the components to enable generation and delivery of cardioversion/defibrillation shocks between the first and second cardioversion/defibrillation electrodes and across the patient's heart.

2. The implantable cardioverter/defibrillator of Claim 1, wherein the high voltage battery is enclosed within the second hermetically sealed housing.

3. The implantable cardioverter/defibrillator of Claim 2, wherein:

the at least one high voltage capacitor and the circuitry powered by the low voltage power source for detecting a tachyarrhythmia, charging the high voltage capacitor, and discharging the high voltage capacitor to provide a

-30-

cardioversion/defibrillation shock are enclosed within the first hermetically sealed housing; and

the high voltage battery is coupled through conductors of the cable to the circuitry for charging the high voltage capacitor.

4. The implantable cardioverter/defibrillator of Claim 3, further comprising a switch circuit between the high voltage battery and the circuitry for charging the high voltage capacitor that is adapted to be closed to enable charging the high voltage capacitor.

5. The implantable cardioverter/defibrillator of Claim 1, wherein the electrical cable is coupled at a first cable end to the first hermetically sealed housing and at a second cable end to the second hermetically sealed housing, and at least one of the first and second cable ends can be disconnected from the respective first and second hermetically sealed housings to enable replacement of the second hermetically sealed enclosure upon depletion of the high voltage battery.

6. The implantable cardioverter/defibrillator of Claim 1, wherein the electrical cable is permanently coupled at a first cable end to the first hermetically sealed housing and at a second cable end to the second hermetically sealed housing.

7. The implantable cardioverter/defibrillator of Claim 1, wherein:

the first hermetically sealed housing supports a two-dimensional array of far-field EGM sense electrodes defining a plurality of EGM sense vectors; and

the circuitry further comprises a sense amplifier for sensing a signal of the cardiac EGM and a selection circuit for coupling the sense amplifier to the array of far-field sense electrodes to sense the EGM in a selected EGM sense vector.

-31-

8. The implantable cardioverter/defibrillator of Claim 1, wherein:
 - the first hermetically sealed housing supports a first pacing electrode;
 - the second hermetically sealed housing supports a second pacing electrode;
 - the circuitry further comprises a pacing pulse generator for generating pacing pulses, the pacing pulse generator coupled to the first pacing electrode; and
 - the cable comprises a pacing conductor coupled between the pacing pulse generator and the second pacing electrode, whereby the pacing pulse generator generates pacing pulses that are delivered to the heart between the first and second pacing electrodes.
9. The implantable cardioverter/defibrillator of Claim 1, wherein:
 - the cable supports a third cardioversion/defibrillation electrode and a cardioversion/defibrillation conductor coupled to the third cardioversion/defibrillation electrode; and
 - the circuitry for discharging the high voltage capacitor to provide a cardioversion/defibrillation shock is coupled to the cardioversion/defibrillation conductor and further comprises means for selectively delivering cardioversion/defibrillation shocks among selected pairs of the first, second and third cardioversion/defibrillation electrodes.
10. The implantable cardioverter/defibrillator of Claim 9, further comprising means for selectively delivering cardioversion/defibrillation shocks having one of a monophasic waveform or a biphasic waveform.
11. An implantable cardioverter/defibrillator comprising:
 - a first hermetically sealed housing supporting a first cardioversion/defibrillation electrode adapted to be implanted at a first subcutaneous implantation site about the patient's thorax directing the first cardioversion/defibrillation electrode toward the patient's heart;

-32-

a second hermetically sealed housing supporting a second cardioversion/defibrillation electrode adapted to be implanted at a second subcutaneous implantation site about the patient's thorax directing the second cardioversion/defibrillation electrode toward the patient's heart, whereby the heart is disposed substantially between the first and second cardioversion/defibrillation electrodes;

a high voltage battery enclosed within the second hermetically sealed housing;

cardioversion/defibrillation shock generating means enclosed within the first hermetically sealed housing coupled to the first cardioversion/defibrillation electrode;

an electrical cable tethering the first and second hermetically sealed housings together and electrically connecting the high voltage battery and the second cardioversion/defibrillation electrode to the cardioversion/defibrillation shock generating means; and

means for triggering generation and delivery of cardioversion/defibrillation shocks between the first and second cardioversion/defibrillation electrodes and across the patient's heart.

12. The implantable cardioverter/defibrillator of Claim 11 wherein the means for triggering generation and delivery of cardioversion/defibrillation shocks further comprises a plurality of components including at least one high voltage capacitor, and circuitry powered by a low voltage power source for detecting a tachyarrhythmia, charging the high voltage capacitor, and discharging the high voltage capacitor to provide a cardioversion/defibrillation shock all enclosed within the first hermetically sealed enclosure.

13. The implantable cardioverter/defibrillator of Claim 12, wherein:
the at least one high voltage capacitor and the circuitry powered by the low voltage power source for detecting a tachyarrhythmia, charging the high voltage capacitor, and discharging the high voltage capacitor to provide a

-33-

cardioversion/defibrillation shock are enclosed within the first hermetically sealed housing; and

the high voltage battery is coupled through conductors of the cable to the circuitry for charging the high voltage capacitor.

14. The implantable cardioverter/defibrillator of Claim 13, further comprising a switch circuit between the high voltage battery and the circuitry for charging the high voltage capacitor that is adapted to be closed to enable charging the high voltage capacitor.

15. The implantable cardioverter/defibrillator of Claim 12, wherein the electrical cable is coupled at a first cable end to the first hermetically sealed housing and at a second cable end to the second hermetically sealed housing, and at least one of the first and second cable ends can be disconnected from the respective first and second hermetically sealed housings to enable replacement of the second hermetically sealed enclosure upon depletion of the high voltage battery.

16. The implantable cardioverter/defibrillator of Claim 12, wherein the electrical cable is permanently coupled at a first cable end to the first hermetically sealed housing and at a second cable end to the second hermetically sealed housing.

17. The implantable cardioverter/defibrillator of Claim 12, wherein:

the first hermetically sealed housing supports a two-dimensional array of far-field EGM sense electrodes defining a plurality of EGM sense vectors; and

the circuitry further comprises a sense amplifier for sensing a signal of the cardiac EGM and a selection circuit for coupling the sense amplifier to the array of far-field sense electrodes to sense the EGM in a selected EGM sense vector.

-34-

18. The implantable cardioverter/defibrillator of Claim 12, wherein:
 - the first hermetically sealed housing supports a first pacing electrode;
 - the second hermetically sealed housing supports a second pacing electrode;
 - the circuitry further comprises a pacing pulse generator for generating pacing pulses, the pacing pulse generator coupled to the first pacing electrode; and
 - the cable comprises a pacing conductor coupled between the pacing pulse generator and the second pacing electrode, whereby the pacing pulse generator generates pacing pulses that are delivered to the heart between the first and second pacing electrodes .
19. The implantable cardioverter/defibrillator of Claim 12, wherein:
 - the cable supports a third cardioversion/defibrillation electrode and a cardioversion/defibrillation conductor coupled to the third cardioversion/defibrillation electrode; and
 - the circuitry for discharging the high voltage capacitor to provide a cardioversion/defibrillation shock is coupled to the cardioversion/defibrillation conductor and further comprises means for selectively delivering cardioversion/defibrillation shocks among selected pairs of the first, second and third cardioversion/defibrillation electrodes.
20. The implantable cardioverter/defibrillator of Claim 19, further comprising means for selectively delivering cardioversion/defibrillation shocks having one of a monophasic waveform or a biphasic waveform.
21. The implantable cardioverter/defibrillator of Claim 11, wherein the electrical cable is coupled at a first cable end to the first hermetically sealed housing and at a second cable end to the second hermetically sealed housing, and at least one of the first and second cable ends can be disconnected from the respective first and second hermetically sealed

-35-

housings to enable replacement of the second hermetically sealed enclosure upon depletion of the high voltage battery.

22. The implantable cardioverter/defibrillator of Claim 11, wherein the electrical cable is permanently coupled at a first cable end to the first hermetically sealed housing and at a second cable end to the second hermetically sealed housing.

23. The implantable cardioverter/defibrillator of Claim 11, wherein:

the first and second hermetically sealed housings have a length extending from a housing free end and a housing end attached to one end of the electrical cable, a housing width and a nominal housing thickness; and

the housing free ends are tapered from the nominal housing thickness to a lesser thickness to ease the subcutaneous advancement of the housing free ends to the first and second implantation sites.

24. A method of implanting an implantable cardioverter-defibrillator within a patient, the method comprising the steps of:

providing a cardioverter-defibrillator comprising a first hermetically sealed housing, a second hermetically sealed housing and an electrical cable interconnecting the first and second hermetically sealed housings;

making a surgical incision into subcutaneous space between the patient's skin and ribcage;

inserting the first hermetically sealed housing through the incision and advancing the first hermetically sealed housing subcutaneously to a first subcutaneous implantation site;

inserting the second hermetically sealed housing through the incision and advancing the second hermetically sealed housing subcutaneously to a second subcutaneous implantation site spaced from the first subcutaneous implantation site so that the electrical cable is disposed subcutaneously between the first and second hermetically sealed housings; and

closing the incision.

25. The method of Claim 24, wherein:

the first and second hermetically sealed housings have a length extending from a housing free end and a housing end attached to one end of the electrical cable, a housing width and a nominal housing thickness; and

the housing free ends are tapered from the nominal housing thickness to a lesser thickness to ease the subcutaneous advancement of the housing free ends to the first and second implantation sites.

26. A method of implanting and operating an implantable cardioverter-defibrillator within a patient, the method comprising the steps of:

providing a cardioverter-defibrillator comprising a first hermetically sealed housing having a first cardioversion/defibrillation electrode, a second hermetically sealed housing having a second cardioversion/defibrillation electrode and an electrical cable interconnecting the first and second hermetically sealed housings;

making a surgical incision into subcutaneous space between the patient's skin and ribcage;

inserting the first hermetically sealed housing through the incision and advancing the first hermetically sealed housing subcutaneously to a first subcutaneous implantation site;

inserting the second hermetically sealed housing through the incision and advancing the second hermetically sealed housing subcutaneously to a second subcutaneous implantation site spaced from the first subcutaneous implantation site so that the electrical cable is disposed subcutaneously between the first and second hermetically sealed housings;

closing the incision;

detecting a tachyarrhythmia; and

delivering an cardioversion/defibrillation shock between the first and second cardioversion/defibrillation electrodes.

-37-

27. The method of Claim 26, wherein:

the first and second hermetically sealed housings have a length extending from a housing free end and a housing end attached to one end of the electrical cable, a housing width and a nominal housing thickness; and

the housing free ends are tapered from the nominal housing thickness to a lesser thickness to ease the subcutaneous advancement of the housing free ends to the first and second implantation sites.